



Prince William County Government
Board of County Supervisors



County Landfill Eco-Park



*Prince William County
Department of Public Works
Solid Waste Division
January 28, 2015*

Unique Opportunities



- Award winning 1000 acre landfill with extensive environmental controls receiving 1000 tons/day of refuse.
- 383 acres of buffer, mostly forested with a number of species of plants, trees and wildlife.
- Wetlands on site with a large wetlands mitigation project underway.
- Large open space of landfill closed areas.
- Supportive community and County commitment.



Eco-Park Concepts



■ Environment

- ◆ Sustainability
- ◆ Environmental Protection

■ Energy

- ◆ Renewable Technologies

■ Education

- ◆ STEM
- ◆ Ecology





Environment



Environment – Current Status



- The County's Solid Waste Facilities (Landfill and Balls Ford Road Composting facility) have been designated as an Extraordinary Environmental Enterprise (E4) participant in the Virginia Environmental Excellence Program (VEEP) effective February 18, 2011.
- Only active landfill to have received this recognition.



Lined Landfill Cell



Landfill Liner



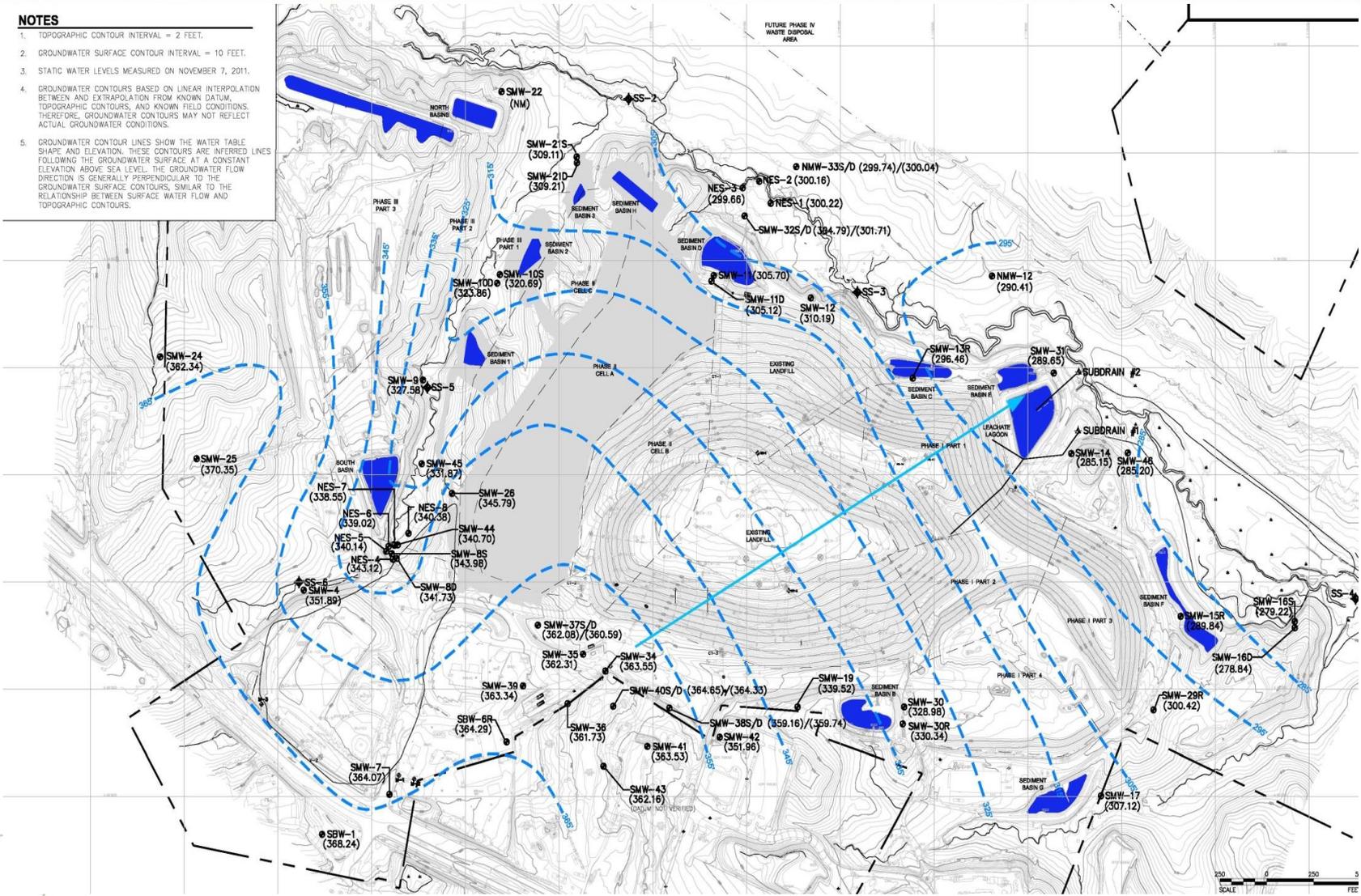
Lined Landfill Cap



Groundwater Monitoring



- NOTES**
1. TOPOGRAPHIC CONTOUR INTERVAL = 2 FEET.
 2. GROUNDWATER SURFACE CONTOUR INTERVAL = 10 FEET.
 3. STATIC WATER LEVELS MEASURED ON NOVEMBER 7, 2011.
 4. GROUNDWATER CONTOURS BASED ON LINEAR INTERPOLATION BETWEEN AND EXTRAPOLATION FROM KNOWN DATUM, TOPOGRAPHIC CONTOURS, AND KNOWN FIELD CONDITIONS. THEREFORE, GROUNDWATER CONTOURS MAY NOT REFLECT ACTUAL GROUNDWATER CONDITIONS.
 5. GROUNDWATER CONTOUR LINES SHOW THE WATER TABLE SHAPE AND ELEVATION. THESE CONTOURS ARE INFERRED LINES FOLLOWING THE GROUNDWATER SURFACE AT A CONSTANT ELEVATION ABOVE SEA LEVEL. THE GROUNDWATER FLOW DIRECTION IS GENERALLY PERPENDICULAR TO THE GROUNDWATER SURFACE CONTOURS, SIMILAR TO THE RELATIONSHIP BETWEEN SURFACE WATER FLOW AND TOPOGRAPHIC CONTOURS.



Surface Water Quality



■ Surface Water Monitoring Program

- ◆ Surface water in Lake Montclair (Powell's Creek) sampled routinely for analysis of metals and water quality indicator parameters.
- ◆ Stormwater basins at Landfill sampled routinely per permit requirement for analysis of permit-required constituents.

◆ Wetlands Project

- Stream relocation - 3800 feet of new stream channel.
- Creation of 5 acres of wetlands



Eco-Park Concepts



Energy



Energy - Opportunities Summary



Resources

- Solar Radiation
- Wind
- Landfill Gas

Conversion Technologies

- Photovoltaic
 - Monocrystalline
 - Polycrystalline
 - Thin Film (Rigid or Flexible)
- Wind Turbines
- Gas Engines, Turbines, Micro Turbines, Boilers

Markets

- Electricity Sales
 - NOVEC
 - Dominion
 - On-site Users
- Heating/Cooling
 - High School
 - County School Board Facility
 - Greenhouses
 - Detention Center
 - Future Church



Landfill Gas Well



The landfill has over 100 extraction wells for collection of landfill gas.



Landfill Gas to Energy Program



■ Existing Energy Recovery Facility

- ◆ NEO Prince William (Fortistar) installed a landfill gas collection facility and a 1.9 MW energy recovery facility became operational in November 1998.
- ◆ Fortistar expanded plant in November 2013 – facility now generates a total of 6.7 MW – enough power for approximately 5000 homes.
- ◆ County receives 5% of energy sales plus payment for gas rights.



Landfill Gas to Energy Program



The landfill gas is converted to electricity to produce 6.7 megawatts of power.

Landfill Gas to Energy Program



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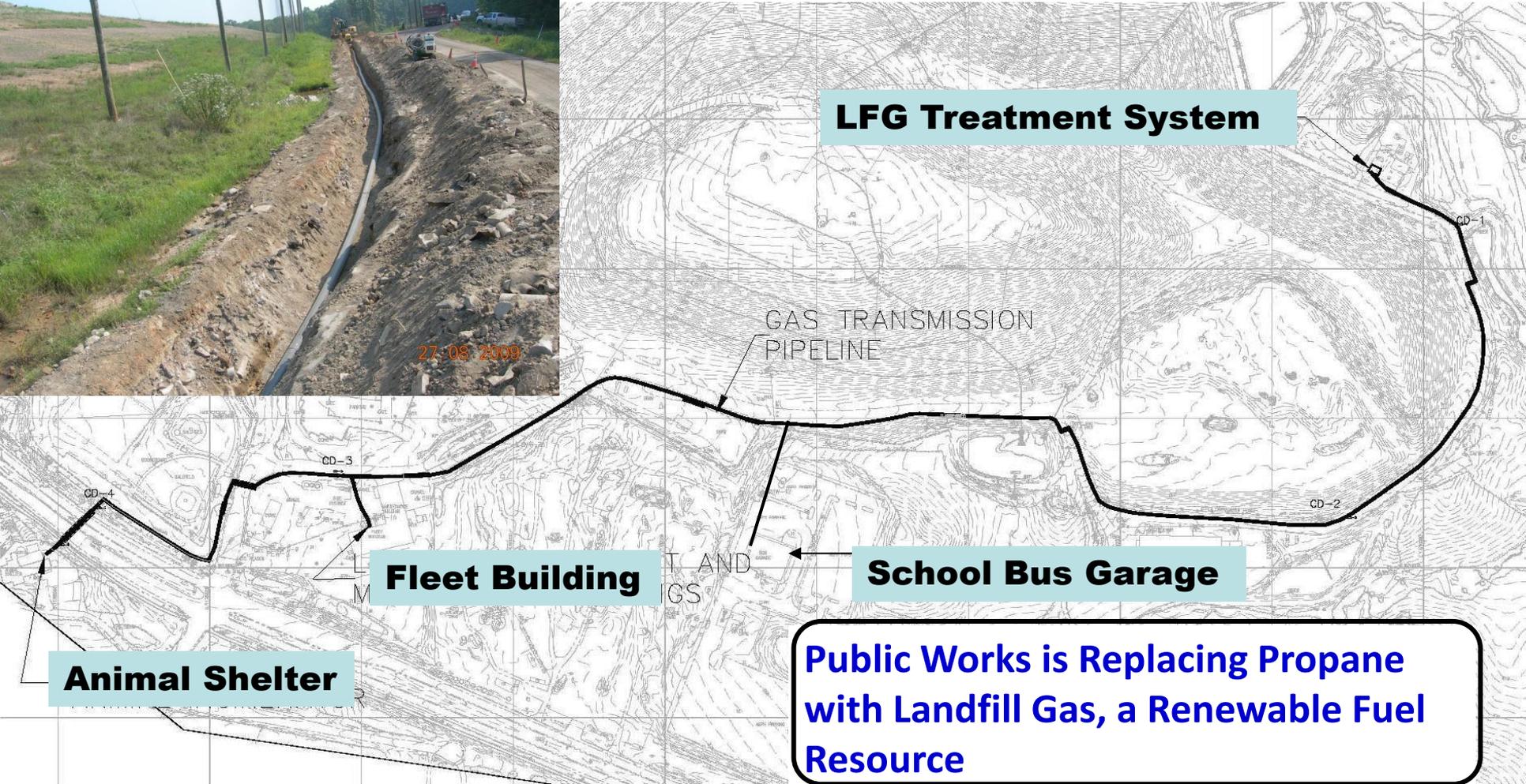
Other Beneficial Uses of LFG



- Approximately 200+ scfm of excess landfill gas is still available even with the operation of the additional engines.
- Direct use of landfill gas is viable.
- A gas pipeline has been installed to provide landfill gas to heat the Fleet Maintenance Building and provide fuel to the Animal Shelter incinerator to replace propane.
- School bus garage added in 2014.



Landfill Gas Pipeline Route



Public Works is Replacing Propane with Landfill Gas, a Renewable Fuel Resource

Direct Use of Landfill Gas – Future Projects



- Evaluating potential to provide landfill gas for heating, cooling and power to Kelly Leadership Center other adjacent County and School facilities.
- BioCNG for vehicle fuel.



Renewable Energy Project – Waste Conversion



- Board entered into a Phase 1 Agreement with LEEP Holdings, LLC to host a demonstration project of an innovative municipal solid waste (MSW) conversion technology.
- Process/Sort mixed solid waste into various useable components
 - Recyclables (Cardboard, Metals etc) – Sold to markets
 - Organics - Fuel Pellet (eRDF)
 - Plastic - Lightweight Aggregate (Balkrete)
 - Residue (Fines) – Landfill



Renewable Energy Project – Waste Conversion



- Engineering and Financing are in progress with due date of January 30, 2015
- Processing Throughput
 - ◆ Years 1 and 2 – 250 tons/day
 - ◆ Years 3 – 300 tons/day
 - ◆ Years 4 to 13 – 400 tons/day

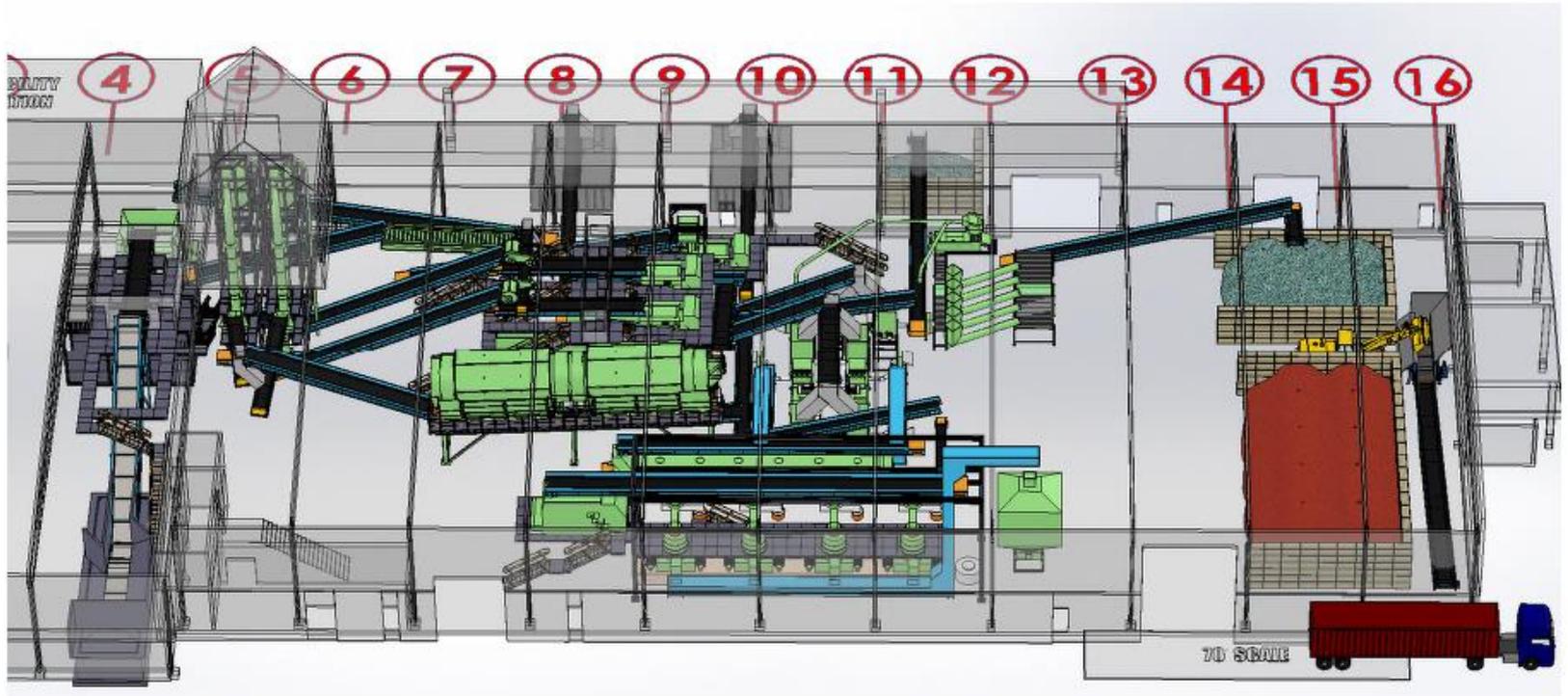


Landfill Site – Waste Conversion



Waste
Conversion
Site

Waste Conversion Schematic

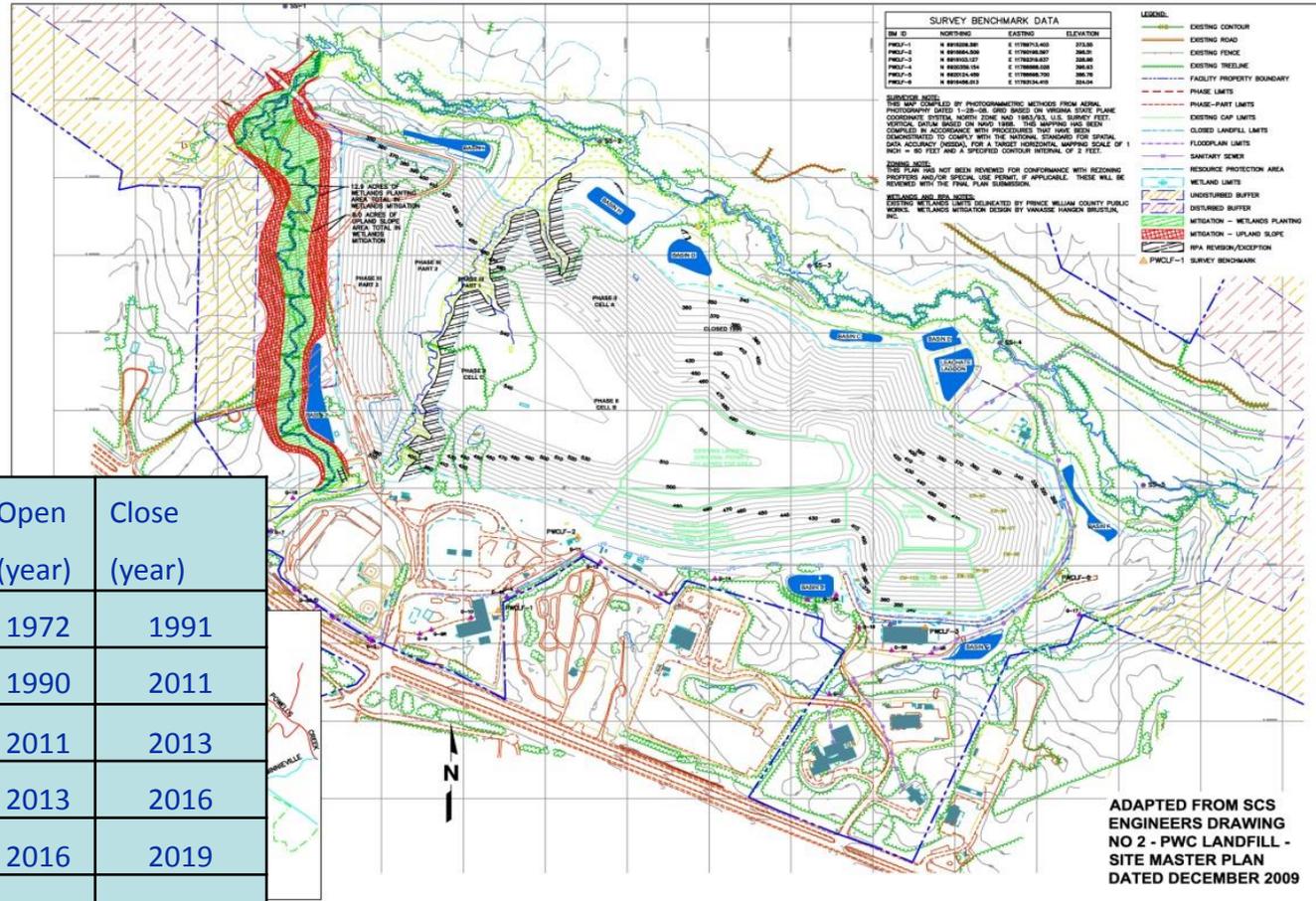


Progress Submittal - November 14, 2014

Isometric View From The South



Future Solar and Wind Site Opportunities



Phase	Part	Base Area (acres)	Open (year)	Close (year)
Existing	--	57	1972	1991
Phase I	1,2,3	39.5	1990	2011
Phase II	1	16.03	2011	2013
	2	15.33	2013	2016
	3	12.64	2016	2019
Phase III	1	13.65	2019	2024
	2	15.09	2024	2028
	3	13.08	2028	2032

ADAPTED FROM SCS ENGINEERS DRAWING NO 2 - PWC LANDFILL - SITE MASTER PLAN DATED DECEMBER 2009

Solar and Wind



- Private interest expressed in developing solar power at landfill site.
- RFP was issued on April 24, 2013
- Negotiating with private company and NOVEC to phase project with net metering to supply power to buildings on site (1.3 MW).
 - ◆ Power to Juvenile Detention Home
 - ◆ Power to Fleet/Admin Facility
 - ◆ Cost is primary issue
- Additional solar generation possible



Solar Panels



Eco-Park Concepts



Education



Current Education and Outreach



- Work with Solid Waste Citizen Advisory Group to be a good neighbor.
- Use of buffer for environmental studies with local 4H Club and Master Gardeners.
- Landfill community events and tours.
- Adjacent school sites (Coles, Benton and New 12th HS).



S.A.L.T. 4-H
The next
Generation



Education Goals



■ County Adopted Strategic Plan - Education

- ◆ The County will provide an education environment rich in opportunities to increase education attainment for workforce readiness, post-secondary education, and lifelong learning.

■ School Draft Strategic Plan – January 2015

- ◆ 1.2.4 - Students will be provided with opportunities to apply technology effectively to gain knowledge, develop skills, and create and disseminate products that reflect their understanding.
- ◆ 3.1 – Engage families, community and employees in partnerships that promote student learning.



Partnership with School Staff



- Meeting with school administration and curriculum staff.
 - ◆ Working on curriculum for 12th high school as to include a unique whole school environmental/ecological sciences program.
 - ◆ Science curriculum staff developing ideas for incorporating landfill facility into environmental curriculum for elementary, middle and high school students.
 - ◆ Working to coordinate project/gain input from George Mason and Catholic Universities.
 - ◆ Solid Waste Citizen Advisory Group participating in discussions.



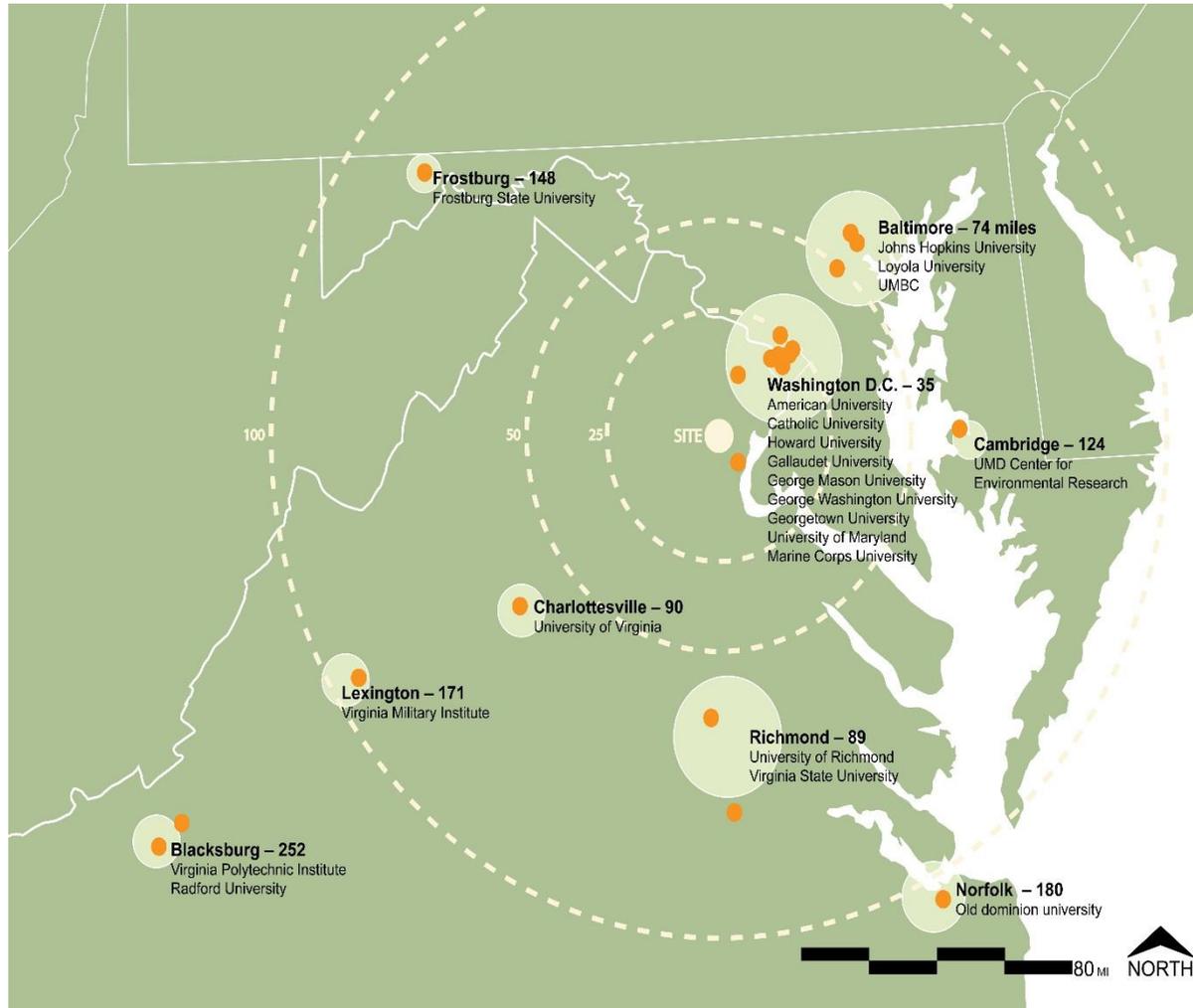
STEM Education Center



- Living Building Challenge
- Reuse and Recycle energy, water, resource, and waste flows that are currently in use
 - ◆ Restore the natural systems balances that have been altered by human mismanagement; Integrate renewable energy, ecological systems, and materials flows in sustainable patterns
 - ◆ Create future-proof and resilient designs that are more closely wedded to natural systems and will be able to adapt in the face of change



Local Colleges & Universities



Education Center - Casting A Wider Net



- Why limit the facility to local colleges & universities when the research has worldwide value?
- Harness the diverse research universities in the area to bring in their local, national and international partners to perform field research.
- Provide a flexible facility that encourages researchers (local, nationally and internationally) to travel to the area presents an exciting opportunity.



Education Center Program Basis



Target Users

Purpose

Frequency and Duration

Community
(citizens)

- Education
- Meetings
- Recreation

- Night and weekend opportunities
- As needed for events

Researchers
(non-profits,
universities)

- Perform research on a unique opportunity
- Share research with local students

- Field trips (weekdays)
- Organized trips (weekends)
- Daily research

Youth
(students,
at-risk youth)

- Learn about green buildings
- Learn about reuse/waste
- Learn how researchers work

- Field trips (weekdays)
- Organized trips (weekends)

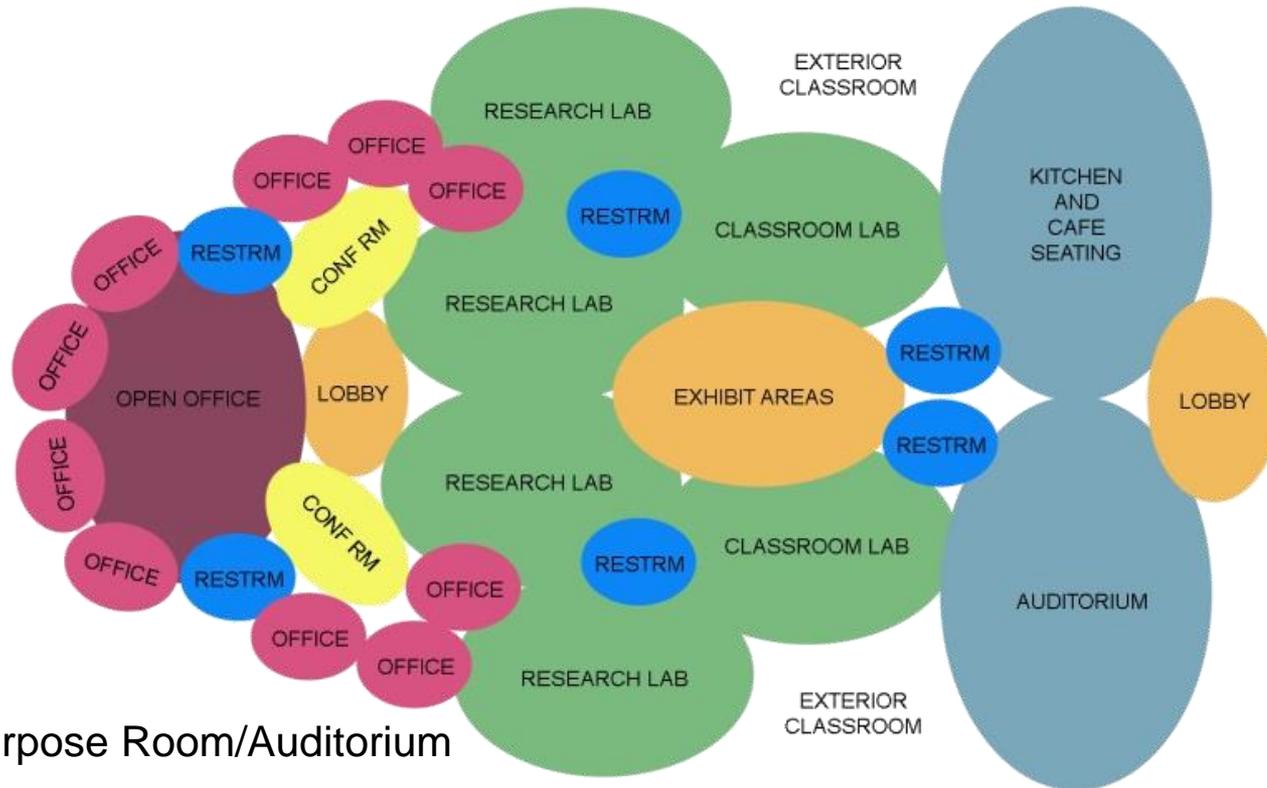
Employees

- Offices
- Training
- Meetings

- Daily work
- Weekly training



Programmed Spaces: Adjacency Diagram



- Multi-Purpose Room/Auditorium
- Lab/Classrooms
- Exhibit Space
- Landfill Employees
- Education Center Employees



Interior Functional Spaces

Approximately: 10,000 sq. ft.



- Lobby Area
 - ◆ Including Educational Displays
- Exhibit/ Gallery space
 - ◆ For Education & Research Use
- Multi-Purpose/Auditorium
 - ◆ For 150 people
- Lab/Classrooms space
 - ◆ 2 rooms for 30 people each
- Catering Kitchen
- Roof top observation deck
- County Office Space
 - ◆ For 11-15 Employees
 - ◆ Conference/Training Room
 - ◆ Break Room/Employee Lockers
- Eco-Park Staff
 - ◆ Offices for 1-2 people
 - ◆ Small kitchen area
 - ◆ Small conference room
- Utility Space
 - ◆ Restrooms
 - ◆ Storage
 - ◆ Circulation



Exterior Functional Spaces



- Greenhouse
- Urban Agriculture
- Site parking
- Electric and/or alternative fuel vehicle fueling stations
- Bus Drop Off & Wait Area
- Composting Area
- Rainwater harvesting cisterns
- Stormwater Swales
- Native and adapted species plant demonstration in swales
- Trails



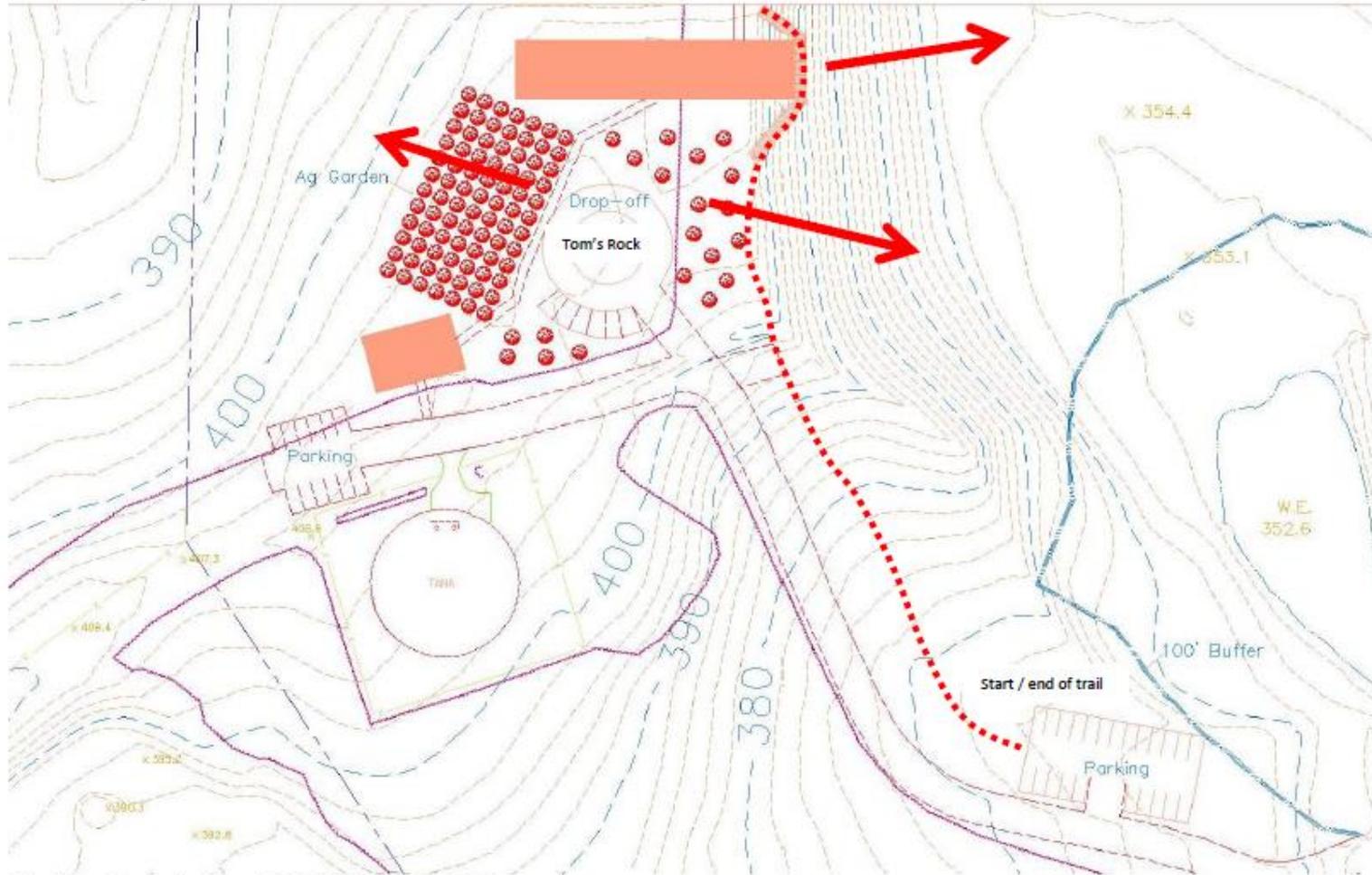
Education Center Site



Education Center Site Layout



Scheme 2: Uplands



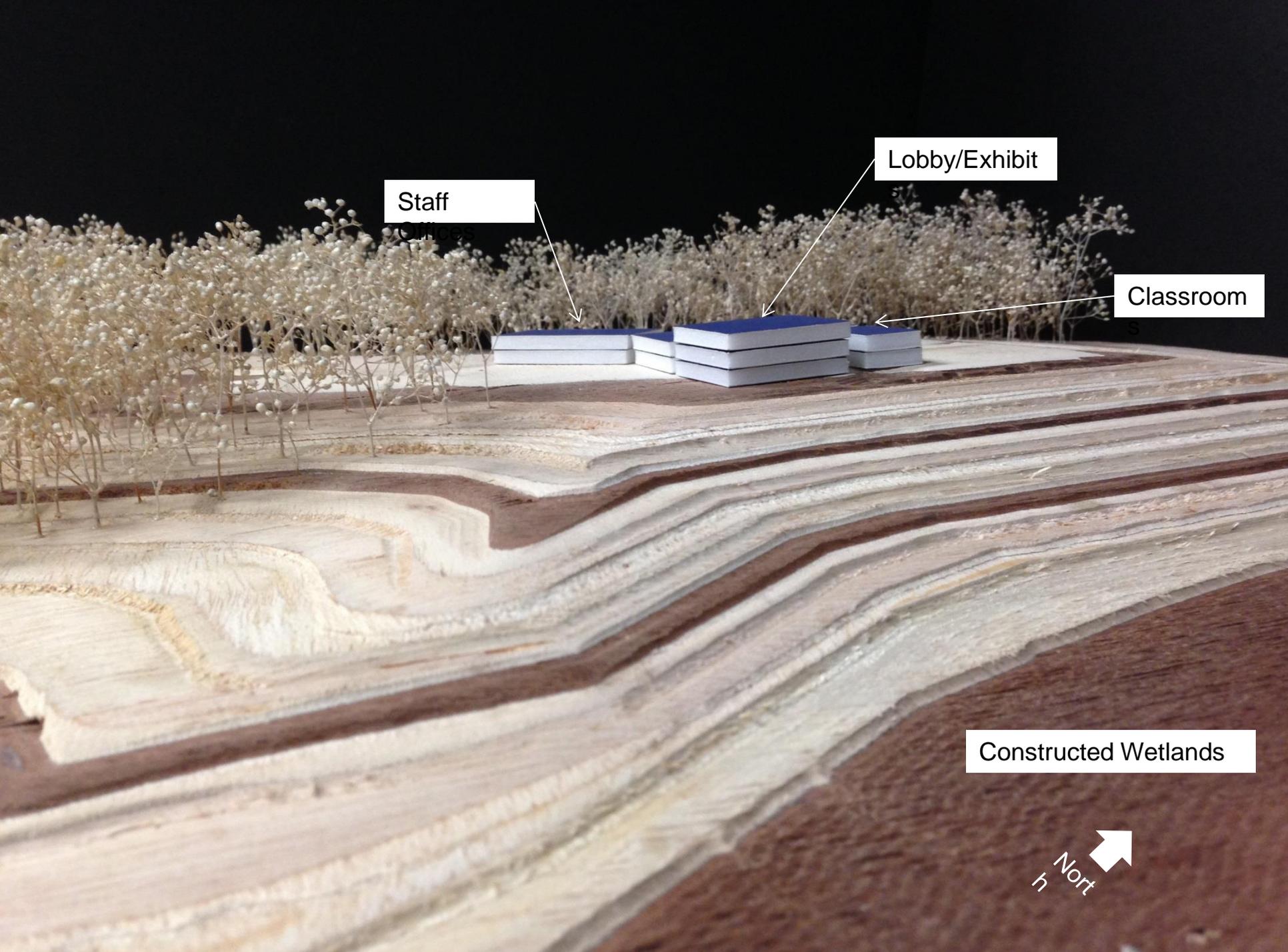
Site Plan: Project Area ~73,000 SF; FAR = ~0.14

Education Center Site



STEM Education Center





Staff

Lobby/Exhibit

Classroom

Constructed Wetlands





Balls Ford Road Yard Waste Compost Facility



Balls Ford Road Yard Waste Site



Balls Ford Road Project Opportunity



- Increase County recycling
- Improve County management of organic wastes
 - ◆ Yard waste
 - ◆ Food scraps
 - ◆ Wood waste
 - ◆ Other organics – biosolids, animal and agriculture wastes
- Enhance Balls Ford Road Operations



Agreement Awarded January 20th



■ Board awarded Agreement to Freestate Farms, LLC

◆ Proposed Project Technologies:

- Anaerobic Digestion (AD) of food waste– 30,000-45,000 ton/yr
- Advanced Composting of yard waste – 30,000-50,000 ton/yr
- Combined heat and power – electricity generation
- Commercial Greenhouses – 2 acres
- Mulching of wood waste

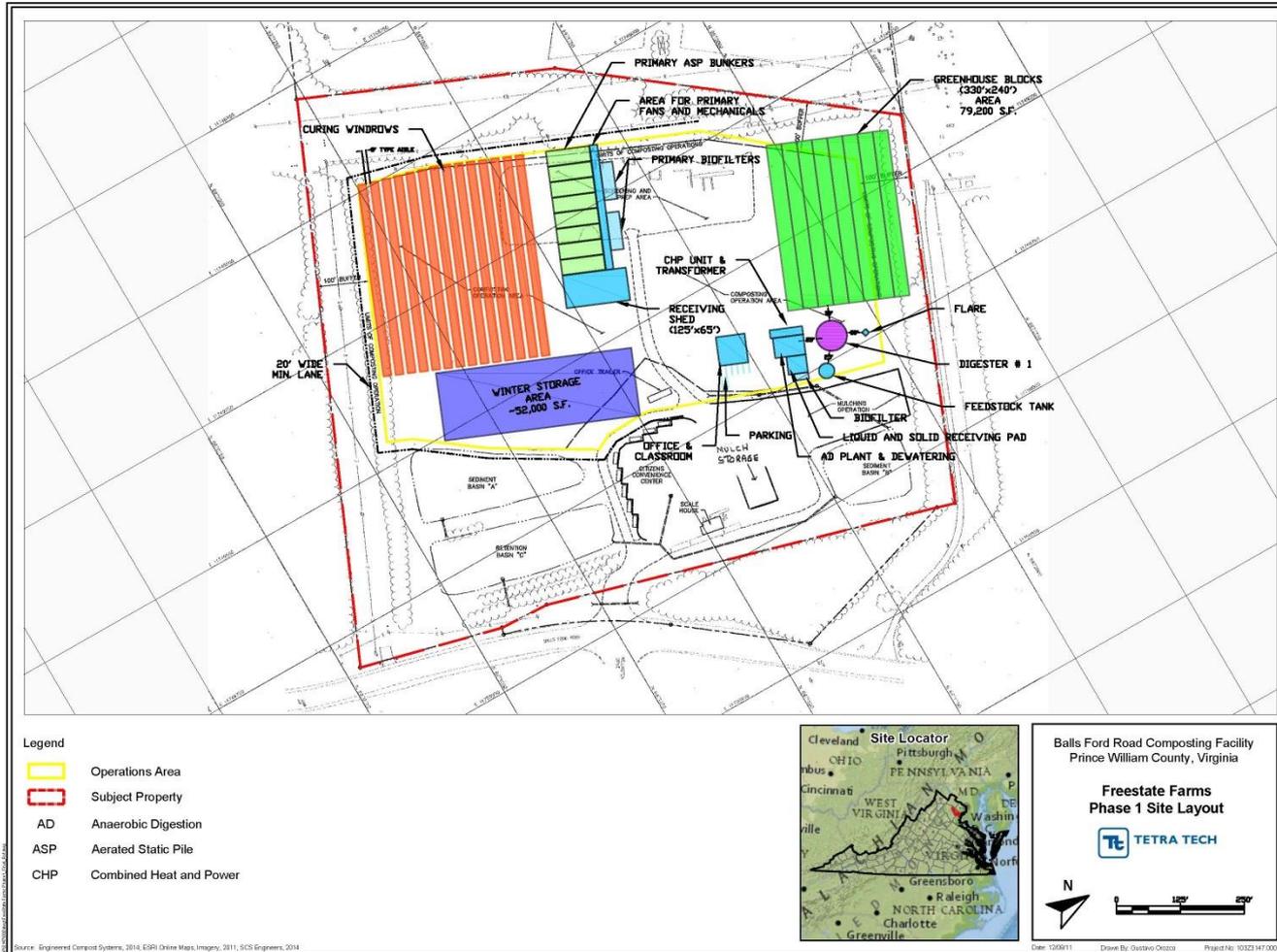
◆ Proposed Expansion – Phase II

- Anaerobic Digestion – 125,000 ton/yr
- Composting – 85,000 ton/yr

◆ Includes transition period



Site Plan – Phase 1



County Landfill Eco-Park



Questions and Comments?

